Sudden Death in Infancy (A Preliminary Communication)

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SUDDEN death in infancy presents a problem of considerable importance to the coroner and medico-legal pathologist. It also merits the interest of those concerned with child health, at least in so far as certain of the deaths are ascribable to accidental and presumably avoidable causes.

Source of material.—The term "sudden death" may be used with varying implications. For the purpose of the present study the criterion adopted was that death occurred unexpectedly, an antecedent state of illness being admissible, but only when there was no suspicion of impending decease. The cases studied were all subjected to post-mortem examinations at the Pathology Department of the Welsh National School of Medicine, during the period January 1941 to May 1948.

The yearly incidence of the autopsies performed during the period selected shows a steady and significant increase (Table I).

TABLE I

Year	1941–2	1942–3	1943–4	1944–5	1945–6	1946–7	1947–8	1948 Jan.–May
No. of cases	1	5	7	12	12	14	19	11

It would seem probable that this increase is to a large extent the result of greater cautiousness on the part of the practitioner and coroner, with more frequent appeal to autopsy in verifying the cause of death.

Post-mortem examinations were conducted on 81 cases of unexpected death occurring during infancy. The age distribution (fig. 1) reveals that nearly one-third of these took place

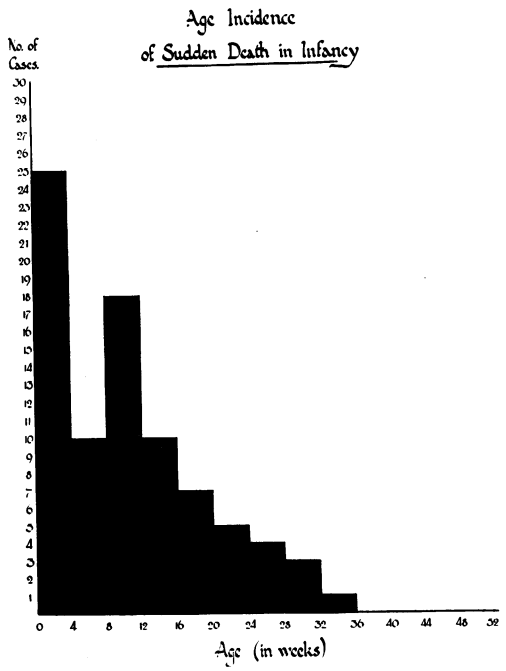

FIG. 1.

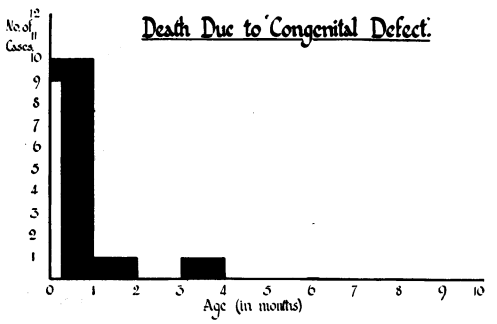

FIG. 2.

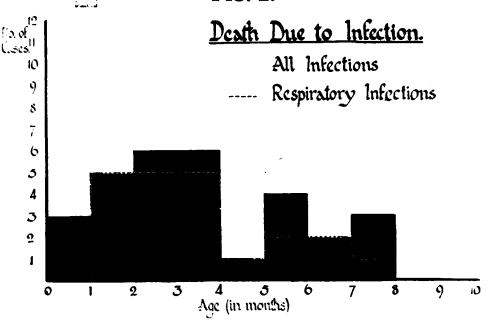

FIG. 3.

in the neonatal period and that thereafter there was a fairly uniform decrease in the incidence with increasing age.

A preliminary case analysis was made into four main divisions (Table II).

TABLE II

Cause of death	No. of cases	Cause of death	No. of cases
Infectious process	30	Mechanical suffocation ..	16
Aspiration of regurgitated food	23	"Congenital defect"	12

(1) *Death due to a "congenital defect"*.—12 cases. In one case a previously symptomless infundibular cyst produced an acute fatal hydrocephalus. In another a large intrathoracic cyst was present, considered on histological grounds to be derived from enteric epithelium. The remainder of the group comprised gross cardiac defects (5), pulmonary atelectasis (3), neonatal hæmorrhagic disease (1) and an instance of asphyxiation produced by a grossly mobile tongue.

The cases thus grouped died almost exclusively in the first month of life (fig. 2) and indeed 9 of them were aged 1 week or under. Thus concentrated they represent an important proportion of the total deaths encountered in the neonatal period.

(2) *Death due to an infectious process.*—Infection was the major cause of death, accounting for about a third of all cases (fig. 3). In two-thirds of these (21 out of 30) the site of infection was respiratory (viz. upper respiratory infection (7), suppurative bronchopneumonia[1] (9) and acute interstitial pneumonia (5)).

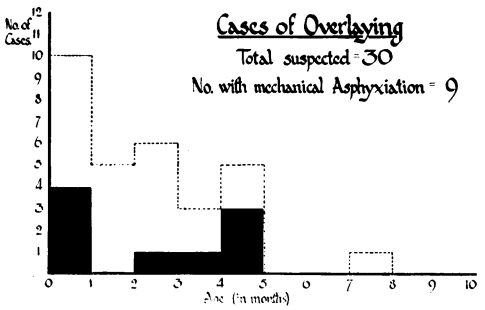

FIG. 4.

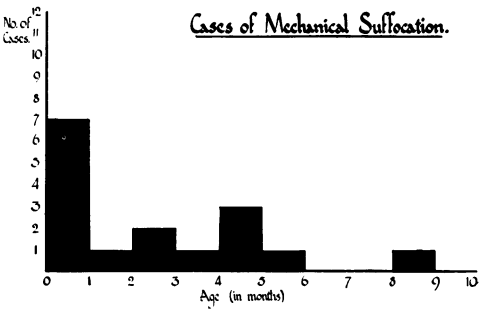

FIG. 5.

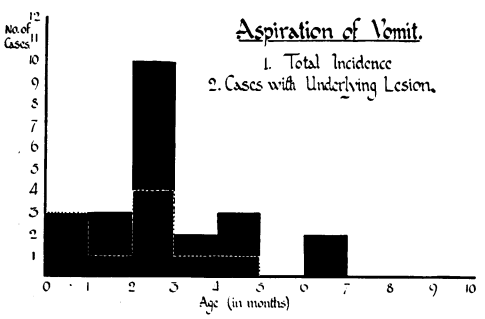

FIG. 6.

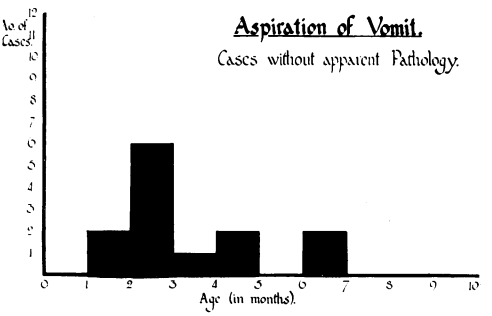

FIG. 7.

Other conditions responsible for death in this group included single cases of encephalitis, meningitis and acute hepatitis.

(3) *Death due to mechanical suffocation.*—In 30 of the cases studied, death had occurred while the infant was in a bed with one or more other occupants. At autopsy, however, only 9 of these infants presented signs of asphyxiation which could have been ascribed to overlaying—the remainder showed another adequate cause for death. The striking difference between the incidence of suspected overlaying and substantiated mechanical asphyxiation is shown in fig. 4.

The remaining 51 cases died when alone in bed, and of these 7 were considered to have died from asphyxiation as the result of pressure from bedclothes. Thus of the 81 cases investigated in this paper a total of 16 only appeared to have suffered mechanical asphyxiation (fig. 5).

It has perhaps been the tendency in the past for practitioners and coroners to assume that sudden death in an infant is likely to be due to unnatural causes, notably suffocation, sometimes with the result that investigations have not included autopsy. From the present study, the author is in complete agreement with Davidson [1] that such examination is an indispensable routine; moreover it should include histological studies, for especially in infancy, organs which appear normal to the naked eye not infrequently show a well-defined lesion microscopically.

[1]An unsuspected duodenal ulcer found in one case of bronchopneumonia was exhibited at the meeting.

In occasional instances, however, autopsy results may lead to a mistaken presumption of mechanical suffocation, e.g. where an unobserved convulsion has occurred. In one instance a 2-day old baby was found at post-mortem to have visceral manifestations of asphyxia, with signs of facial pressure and anterior lividity. Death had actually taken place during a convulsion, and the signs suggesting suffocation from facial pressure were the result of subsequent deposition of the body in a package face-downwards. Had the convulsion not been noted death might have been attributed to mechanical asphyxia.

(4) *Death due to aspiration of regurgitated food.*—Twenty-three infants were considered to have died from asphyxia due to aspiration of regurgitated food (fig. 6).

Most pathologists would accept the finding of regurgitated material distributed throughout the lower airway as a sufficient explanation for asphyxial death. Simpson [2] has recently asserted that this is, in fact, a reversal of cause and effect, in that a state of asphyxiation induces vomiting, and subsequently inhalation of the vomitus may occur. He offers this theory without accompanying evidence.

It was noted in 10 cases, or nearly half of those with aspiration, that an underlying lesion was present which might reasonably be expected to produce vomiting rather than asphyxiation, viz. gastro-enteritis, otitis media, upper respiratory infection, &c. Further, though the series is admittedly a small one, the cases of undoubted mechanical suffocation (fig. 5) and those of aspiration of vomit show no correlation in age-incidence. Certainly many instances of asphyxia were unaccompanied by vomiting. Thus the evidence does not support Simpson's contention.

Another study of aspiration of vomit by Gardner [3] suggests that it is almost exclusively limited to artificially fed babies. He observes the small compact nature of the stomach of breast-fed infants at post-mortem and the liability to gross gastric distension in bottle-fed babies, presumably due [*sic*] to incidental aerophagy. Hence he deduces that an endeavour to regurgitate the gastric air-cap in the latter group leads to a possibility of inhalation of vomitus. In the present series, the mode of feeding was ascertainable in 12 out of the 23 cases showing aspiration and of these 4 were breast fed. Further, in those cases in which no underlying lesion was established (fig. 7) and where dietetic causes might possibly be of greater significance, 3 out of 7 cases were breast fed. Aspiration of stomach contents in breast-fed babies does not therefore seem to be a rare occurrence as Gardner has asserted. The apparently increasing incidence of aspiration of regurgitated food was the subject of a recent annotation in the *Lancet* [4] and subsequent correspondence [5, 6, 7] and certainly merits close attention, especially in view of the possibilities of preventing such a catastrophe. Regurgitation of food is prevalent in infants, but the factors leading to inhalation of the vomitus are as yet ill-defined.

Conclusion.—There appear to have been few extensive studies of sudden death in infancy, a problem which is of peculiar importance in relation to the present attempts to achieve further reduction in infant mortality. Detailed investigation and correlation of the social and pathological aspects are required, and for the latter it is essential to have the service of pathologists who are experienced in this branch of medico-legal work.

Summary.—(1) A preliminary study of the autopsy findings in 81 cases of sudden death in infancy is presented. (2) Of 30 deaths suspected from circumstantial evidence as due to overlaying, 9 were the result of mechanical suffocation; the remaining 21 were ascribable to other causes. (3) Asphyxia due to aspiration of regurgitated food as a cause of death is discussed.

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